

INVESTIGATOR'S ANNUAL REPORT

National Park Service

All or some of the information provided may be available to the public

Reporting Year: 2004	Park: Shenandoah NP
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Permit#: SHEN-2004-SCI-0017	
Park-assigned Study Id. #: SHEN-00260	
Project Title: Monitoring and analysis of water turbidity and bed particle size distribution in an undisturbed, forested, Rosgen class B channel in Shenandoah National Park.	
Permit Start Date: Sep 01, 2004	Permit Expiration Date Sep 01, 2007
Study Start Date: Sep 01, 2004	Study End Date Sep 01, 2010
Study Status: Continuing	
Activity Type: Research	
Subject/Discipline: Water / Hydrology	
Objectives: <p>This project builds on data collection and analysis conducted in the previous project titled: "Monitoring and analysis of reference suspended sediment load in an undisturbed, forested, Rosgen class B channel in Shenandoah National Park." The idea is to fully characterize turbidity and suspended sediment load, over the range of water discharge rates in a natural, undisturbed, forested Rosgen Class B stream reach in Shenandoah National Park. In addition, streambed particle size distribution will be evaluated within the reference reach, and used to analyze hydraulic characteristics including bed shear stress and stream power.</p> <p>Rosgen Class B streams occur naturally in Virginia's mountains and upstream valleys (Catena 1994). This study assumes that (1) turbidities, suspended sediment loads, and bed particle size distributions associated with these undisturbed natural channels are not well known, (2) characterizing the naturally occurring values of these parameters over the range of water discharge rates is helpful to management decision making, policy creation, and water quality standards design, (3) undisturbed forested watersheds provide the most accurate reference to natural conditions, and (4) organizing this information by Rosgen stream type provides meaningful hydrologic and geomorphologic context. Data from undisturbed forest streams, expressed in dimensionless rating curves expressed as related to bankfull discharge, may provide a useful benchmark for comparison with other streams of the same Rosgen stream type and similar fluvial geomorphology.</p> <p>Understanding the reference conditions associated with undisturbed forest streams is essential to placing information in appropriate context. Water quality measurements in undisturbed forest watersheds, essential to understanding the natural tendencies of stream systems, provide a benchmark characterizing the reference condition or signature of the natural system. Measurements of reference water quality parameters in undisturbed forest</p>	

streams, collected over 3 or more consecutive years, have a good chance of capturing conditions over the range of channel forming flows and indicating a normal range of variation in chemical and physical constituents. Measurements of land form, (fluvial geomorphology), associated with the undisturbed channel, determine the natural geometry of the stream channel as formed by water moving through the surrounding landscape. This context allows correct interpretation of data. The Rosgen system of stream classification exploits the fact that streams tend to organize themselves around the most likely combination of variables based on physical and chemical laws. This tendency to seek a dynamic equilibrium reflecting landscape conditions in a watershed lends itself nicely to classification.

Findings and Status:

The study is progressing well.

As reported last year, high water flows due to hurricanes significantly changed the channel cross-section and longitudinal dimensions at the study site. Large amounts of stone were moved along the streambed during these events, burying the channel area where monitoring equipment had been installed. This has made extensive resurvey of channel dimension, pattern, and profile a top priority. New channel surveys scheduled for this summer will help determine the extent of change in channel geometry and how this is affecting previously determined stage-discharge and sediment relationships.

The following products, from analysis of collected measurements, are now available:

- 1) A turbidity reference curve, expressing turbidity as a function of stream water discharge, for an undisturbed Rosgen Class B Stream Reach in Virginia.
- 2) Dimensionless reference curves expressing the ratios of natural channel hydraulic geometry to bankfull dimension for an undisturbed Rosgen Class B Stream Reach in Virginia.
- 3) Stream Bed particle size distributions, determined using the Wolman Pebble Count method, for an undisturbed Rosgen Class B Stream Reach in Virginia.

Future collection and analysis of measurements will yield the following products:

- 1) A suspended sediment reference rating curve, expressing suspended sediment as a function of stream water discharge for an undisturbed Rosgen Class B Stream Reach in Virginia.
- (2) A dimensionless sediment reference curve, expressing suspended sediment as a function of the fraction of bankfull stream water discharge for an undisturbed Rosgen Class B Stream Reach in Virginia.
- (3) A non-linear statistical model of suspended sediment load as a function of stream water turbidity for an undisturbed Rosgen Class B Stream Reach in Virginia.
- (4) Revised dimensionless reference curves expressing the ratios of natural channel hydraulic geometry to bankfull dimension for an undisturbed Rosgen Class B Stream Reach in Virginia.
- (5) Revised streambed particle size distributions, determined using the Wolman Pebble Count method, for an undisturbed Rosgen Class B Stream Reach in Virginia.
- (6) Revised data showing stream water discharge, water level, turbidity, and suspended sediment load for an undisturbed Rosgen Class B Stream Reach in Virginia.
- (7) Ancillary measurements and possible reference rating curves for stream water temperature, conductivity, dissolved oxygen, pH, and nitrate nitrogen in an undisturbed Rosgen Class B Stream Reach in Virginia.

In addition, new post-hurricane field surveys will determine any changes in channel geomorphology, capacity, and streambed particle size distribution resulting from the hurricane induced water flows.

For this study, were one or more specimens collected and removed from the park but not destroyed during analyses?

No

Funding provided this reporting year by NPS:

0

Funding provided this reporting year by other sources:

5000

Fill out the following ONLY IF the National Park Service supported this project in this reporting year by providing money to a university or college

Full name of college or university:

n/a

Annual funding provided by NPS to university or college this reporting year:

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